

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Animal Abstract

Element Code: AFCHA02100
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Oncorhynchus gilae*
COMMON NAME: Gila Trout
SYNONYMS: *Salmo irrideus*, *Salmo gilae*, *Oncorhynchus gilae gilae*
FAMILY: Salmonidae

AUTHOR, PLACE OF PUBLICATION: *Salmo irrideus* Gibbons; Snyder 1915:
(misidentification). *Salmo gilae* Miller 1950a: Occasional papers of the Museum of Zoology,
University of Michigan.

TYPE LOCALITY: Main Diamond Creek, 53 KM ESE Beaverhead. T11S, R10W, Gila
National Forest, Sierra Co., New Mexico; Gila National Forest, New Mexico.

TYPE SPECIMEN: The holotype, a mature male 204.0 mm (8.0 in.) in standard length,
University of Michigan Museum of Zoology No. 137088, was secured by R.R. Miller from
brood stock at the Glenwood Fish Hatchery, Glenwood, Catron County, New Mexico, on July
17, 1939. The stock reared at this hatchery came from Diamond Creek, a tributary of Gila
River, approximately 33 miles east-southeast of Beaverhead, Sierra County, New Mexico.
Twelve paratypes, U.M.M.Z. NO. 137089, 110.0 to 225.0 mm (4.3 to 8.9 in.) long, were
obtained with the holotype. Sixty-two paratypes, 53.0 to 128.0 mm (2.1 to 5.0 in.) long,
U.M.M.Z. No. 137090, were seined from Diamond Creek on July 18, 1939, by R.R. Miller and
J. Davis.

TAXONOMIC UNIQUENESS: Related to other salmonids in genus *Oncorhynchus* in North
America. Closely related to *Oncorhynchus apache* in Arizona. Behnke (1992) recognizes the
two native Arizona trout as the subspecies *O. gilae gilae* and *O. gilae apache*.

DESCRIPTION: "Coloration: Head yellow with black spots; "cutthroat mark" yellowish;
opercles dark copper; back and side above lateral line with a golden iridescence, sometimes
washed with metallic blue, scattered with numerous dark spots (maximum, 30 per cm²), spots
larger dorsally, diminishing in size toward lateral line; a pinkish lateral band present; lower
sides deep yellow; abdomen grayish white to pinkish orange. Fins: Dorsal yellow, first three or
four rays yellowish orange to white, round or oval spots fine and dense; adipose deep yellow
marked with large spots; caudal yellow, spotting dense; anal yellow with first five or six rays
tipped with white, lower rays becoming reddish; pectorals and pelvics yellowish orange edged
with white. Parr marks of young retained throughout life, becoming fainter with age" (Sublette
et al. 1990).

"Head: Conical; SL/HL = 3.4-4.1; SL/HW = 6.5-6.7. Maxillary extending beyond eye.
Basibranchial teeth usually absent (Behnke and Zarn 1976) although occasionally present in the
Spruce and Dry Creek populations. Branchiostegal rays 10 (9-11). Gill rakers 19 (18-20)"
(Sublette et al. 1990).

"Body: Average total length about 300.0 mm (11.8 in.); maximum total length approximately
550.0 mm (21.7 in.). SL/BD = 3.6-3.9. Lateral series with 130-165 scales. Scales above lateral
line 24-38; below lateral line 23-27. Pyloric caeca 25-46 (Behnke and Zarn 1976). Vertebrae
59-63 (Minckley 1973; Behnke and Zarn 1976)" (Sublette et al. 1990).

"Fins: Dorsal triangular, origin anterior to that of pelvics. Adipose present dorsally, length about 11.6 per cent standard length. Caudal shallowly forked, lobes rounded. Anal triangular. Pectorals bluntly pointed. Pelvics short, about 14.0 per cent of standard length. Rays: Dorsal 9-12; pectorals 14 (13-15); pelvics 10 (9-10); anal 10 (9-11); caudal 18-19" (Sublette et al. 1990).

AIDS TO IDENTIFICATION: "The absence of both reddish markings on the inner border of the mandible (cutthroat markings) and large black spots (as large as the pupil of the eye) will distinguish *O. gilae* from *O. clarki*. The absence of reddish spots laterally will distinguish *O. gilae* from *Salmo trutta* and *Salvelinus fontinalis*. The golden yellow color dorsolaterally, and the presence of parr marks noticeable on fish up to 25.0 cm (9.8 in.) TL will distinguish *O. gilae* from *Oncorhynchus mykiss* (Walbaum). *Oncorhynchus gilae* superficially resembles *Oncorhynchus apache* which is known only from Arizona, although LaBounty and Minckley (1972) speculate that this species may have occurred in New Mexico in earlier times. However, *O. apache* has a spot behind the eye, on the head, and large spots on the body whereas *O. gilae* lacks the postorbital spot and is characterized by numerous small dark spots on the upper half of the body; spotting becomes more abundant on larger (>20.0 cm (7.9 in.) TL) adults" (Sublette et al. 1990).

ILLUSTRATIONS: Color drawing (Behnke 1992)
B&W drawing (Behnke (1992:213)
B&W photo (Minckley 1973:60)
Color drawing (Page and Burr 1991)
Color photo (Rinne and Minckley 1991:9)
Color drawing (Sublette et al. 1990)

TOTAL RANGE: "New Mexico: The Gila trout apparently occurred throughout the upper Gila drainage in New Mexico and Verde and Agua Fria drainage in Arizona. Its purported historical occurrence in Eagle Creek, Arizona, and the unique characteristics of individuals taken from Spruce Creek, suggest that it may also have been indigenous to the San Francisco drainage. Behnke and Zarn (1976) also cite the occurrence of trout similar to *O. gilae* from the Rio Yaqui of Mexico, a basin contiguous with the Gila River system. Gila trout have persisted in five streams within the Gila National Forest, New Mexico, including: Iron, McKenna, and Spruce creeks in the Gila Wilderness Area, along with Main and South Diamond creeks in the Aldo Leopold Wilderness Area. The populations in these five streams are genetically distinct (Loudenslager et al. 1986). There is recent speculation that the trout in upper White Creek may be pure Gila trout (P. Turner, pers. comm.). Confirmation of this awaits electrophoretic analysis. As a result of transplants, six additional populations of Gila trout exist in the Gila National Forest including populations in Sheep Corral (Canyon) Creek, a tributary of Sapillo Creek; McKnight Creek, a tributary of the Mimbres River; Little Creek, a tributary of the West Fork of the Gila River; Big Dry Creek (upstream of Golden Link Cabin) in the San Francisco River drainage; and Trail Canyon and Woodrow Canyon creeks along with the East Fork of Mogollon Creek, all tributaries of Mogollon Creek. The transplanted populations in Sheep Corral (Canyon) and McKnight come from Main Diamond Creek, while the populations in Little Creek is from McKenna Creek. The populations in the Mogollon Creek drainage are from South Diamond Creek. McKnight Creek is east of the Continental Divide and, therefore, outside the historical distribution of the Gila trout. Hybridized populations (with *O. mykiss*) occur on the Gila National Forest in Black Canyon, Langstroth, Lipsey, upper Mogollon, White and Sycamore Canyon creeks (David 1976). Standing crops of Gila trout in the five original headwater streams range from 25.7 kg/ha to 200.3 kg/ha, thus equaling or exceeding those for other salmonids from comparable sized streams (Turner 1986)" (Sublette et al. 1990).

RANGE WITHIN ARIZONA: *Oncorhynchus gilae* found historically in the Verde and Agua Fria drainages in Arizona. Gila trout from Main Diamond Creek, Gila National Forest,

New Mexico, were introduced into a tributary of the Verde River, Gap Creek, Prescott National Forest, Arizona, in 1974. Fisheries surveys in 1993 revealed no Gila trout and they were considered extirpated from Arizona. Historically, Gila trout may have occupied tributaries of the San Francisco River drainage, particularly Eagle Creek (Arizona) and Spruce Creek (New Mexico) (Minckley 1973, Mulch and Gamble 1956). Possible tributaries of the Verde River drainage, Arizona, Oak Creek and West Clear Creek may have had populations of Gila trout (Miller 1972). Sycamore Creek, a tributary of the Aqua Fria River, Arizona, historically may have had Gila trout (Behnke and Zarn 1976). Introduced into Dude Creek in September 1999. This population is in jeopardy stemming from problems resulting from the Dude Creek Fire.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Spawns in late spring and summer. Hybridizes with non-native salmonids. Attains 7.6-10 cm (3-4 in) in the first year of life with maximum size being about 28-33 cm (11-13 in).

REPRODUCTION: "Spawning appears to occur during spring and summer in New Mexico. In McKnight Creek, where the population density is relatively low, female Gila trout mature at age III at a minimum size of 172.0 mm (6.8 in.) TL. In the more highly populated Main Diamond Creek, females reach maturity at age IV or V at a minimum size 133.0 mm (5.2 in.) TL (Nankervis 1988). Males tend to mature one to two years earlier than females in any given stream (P. Turner, pers. comm.). Rinne (1980) reported spawning from April through June when water temperatures were 8NC or greater; incubation required 8-10 weeks with the larvae emerging from the redds at 15.0-20.0 mm (0.59-0.79 in.) total length. Redd construction and spawning occurs as early as March in lower elevation streams and incubation and emergence probably can occur in less than eight weeks in warmer water temperatures (P. Turner, pers. comm.). Redds are usually constructed in water 7.6-15.2 cm (3-6 in) deep, with substrate 3.8 cm (1.5 in) or finer and range 0.8-1.4 m (2.5-4.5 ft) in diameter. Fecundity for Gila trout is related to size, age, and rate of growth (Nankervis 1988). According to Regan (1966), the number of eggs produced from females held in hatcheries averaged about 150. Nankervis (1988) reported the mean fecundity per female to be 143 and 335 eggs in Main Diamond and McKnight Creeks respectively. Maximum fecundity observed was 686 eggs. Mean ova diameter ranges from 2.72-4.00 mm (0.11-0.16 in.)" (Sublette et al. 1990).

"Sexual Differences: Breeding males with the pinkish lateral band intensified and the abdomen streaked with yellow or orange" (Sublette et al. 1990).

FOOD HABITS: An opportunistic feeder utilizing aquatic invertebrates, and small fishes, although it feeds primarily on adult and nymph stages of aquatic insects; trichopterans, ephemeropterans, chironomids, coleopterans and terrestrial insects. Gila trout generally feed from 0900 - 1300 (Van Eimeren 1988).

HABITAT: Gila trout are found in small mountain headwater streams, which are generally narrow and shallow, and rarely exceed 21°C (70°F). Siltation is usually low and cobble is the predominate substrate. During drought years they tend to be confined to pools with sufficient depth and cover. Gila trout use cover extensively (stream improvement structures, branches, logs and undercut banks). Tolerances to water chemical parameters (pH, conductivity dissolved oxygen, temperature, etc) are similar to other salmonids. Critical thermal maxima ranges 25.57-28.25°C.

ELEVATION: 1,660 - 2,810 m (5,446 - 9,220 ft.) in New Mexico (Gila National Forest).

PLANT COMMUNITY:

Streams containing populations of Gila trout encompass two riparian vegetative communities (Brown 1982). The arctic-boreal riparian community occurs within subalpine forest (about 2,450-3,500 m elevation) and extends to lower elevations in cool microclimates. Shrub willows (e.g., *Salix monticola*, *S. scouleriana*, *S. bebbiana*, *S. irrorata*) commonly form thickets along streams. Other deciduous shrubs such as red elderberry (*Sambucus racemosa*), goose-berry currant (*Ribes* spp.), raspberry (*Rubus* spp.), and thin-leaf alder (*Alnus tenuifolia*) are also common. Tree species of the subalpine conifer forest such as Englemann spruce (*Picea englemannii*), blue spruce (*Picea pungens*), subalpine fir (*Abies lasiocarpa*), and aspen (*P. tremuloides*) are often present. The cold-temperate riparian community (about 1,700-2,300 m elevation) is the predominate type along streams currently occupied by Gila trout. Major components of this community are narrowleaf cottonwood (*P. angustifolia*), box elder (*Acer negundo*), alder (*A. oblongifolia*), and willows. Montane woodland and conifer forest species such as white fir (*A. concolor*), aspen, ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), New Mexico locust (*Robinia neomexicana*), and smooth sumac (*Rhus glabra*) often occur. Shrub growth of willows and other species such as red-osier dogwood (*Cornus stolonifera*) and thin-leaf alder is frequently a dominant aspect.

POPULATION TRENDS: Historically and currently Gila trout populations are subjected to floods, fires, low flows (drought years) and grazing which can severely limit population size and density of this species (McHenry 1986, Mello and Turner 1980, Regan 1964, and Turner 1989).

Status of populations in New Mexico and Arizona:

Main Diamond Creek, N.M. Stream improvement structures were placed in this stream during the 1930's. Populations of Gila trout were stable until the Divide fire in 1989. 566 Gila trout were removed to Mescalero National Fish Hatchery during the fire. Hail and rainstorms occurred after the fire and total suspended solids in the stream on July 20, 1989 was 181, 452 mg/l (P.R. Turner 1991). Trout habitat was eliminated and no Gila trout were found during fisheries surveys in October 1989 and May 1990 (D.L. Propst 1991).

McKnight Creek, N.M. Flooding in 1988 resulted in a 90% loss of Gila trout (Turner 1989). In October 1989, 200 Gila trout from Main Diamond Creek were stocked in this stream. Stream improvement structures and willow plantings were installed in 1989-90.

Sheep Corral Canyon Creek N.M. In 1972, 89 Gila trout from Main Diamond Creek were transplanted into this stream to establish a new population (Turner 1989).

South Diamond Creek, N.M. Dry streambeds and effects of the Divide Fire have reduced Gila trout populations in certain reaches of this stream. A small population of Gila trout in the Burnt Canyon reach survived the fires and were found in May, 1990 (D.L. Propst 1991).

Trail Canyon Creek, N.M. Treated with antimycin A in October, 1986, and July, 1987, to remove non-native trout. 305 Gila trout from South Diamond Creek were stocked into this stream in September, 1987, and October, 1988. Reproduction was confirmed in 1989 (Propst et al. 1992).

Upper Mogollon Creek, N.M. Treated with antimycin A in July, 1987, and July, 1988, and April, 1989. 100 fingerling Gila trout and 93 adult Gila trout from Trial Canyon were stocked in this stream.

McKenna Creek, N.M. Gila trout population has hybridized with rainbow trout since 1974 (B. Riddle 1991).

Little Creek, N.M. Concrete barrier installed in 1982 and 9Km of stream treated with antimycin A. In December, 1982, 100 Gila trout from McKenna Creek were stocked into this stream. The population increased through 1988. Flooding in August 1988 diminished the Gila trout population.

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Oncorhynchus gilae

Iron Creek, N.M. In 1981 a concrete barrier was installed. Treated with antimycin A in 1982-83, Gila trout survival was low. Additional stockings of Upper Iron Creek fish have showed an increase in the Gila trout population (Turner 1989).

Sacaton Creek, N.M. 40 Gila trout from Iron Creek were stocked into this stream in May, 1990. 60 additional fish were stocked in June, 1991.

Spruce and Big Dry Creeks, N.M. Spruce Creek population is alright and 97 fish from Spruce Creek were stocked into Big Dry Creek in October, 1985, following renovation with antimycin A in 1984. Fingerling Gila trout were found in 1990 (D.L. Propst 1991).

Gap Creek, Az In 1974, 65 Gila trout from Main Diamond Creek, were transplanted into this stream, a tributary of the Verde River in Prescott National Forest (Minckley and Brooks 1985 and Warnecke 1987). The population increased to 150 fish but has recently dwindled to just a few. Surveys in 1993 revealed no Gila trout (J. Warnecke pers. comm. 1994).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:

LT (USDI, FWS 2006)

[LE USDI, FWS 1973]

[LE USDI, FWS 1967]

STATE STATUS:

1A (AGFD SWAP 2012)

[WSC, AGFD, WSCA in prep]

[State Endangered AGFD, TNW 1988]

OTHER STATUS:

Not Forest Service Sensitive (USDA FS Region 3 2007)

[Forest Service Sensitive, USDA, A/S National Forests 2000]

[Forest Service Sensitive, USDA, FS Region 3 1988]

State Endangered, Group II, State of New Mexico, 1975-01-24.

MANAGEMENT FACTORS: Gila trout populations in small headwater streams are susceptible to natural disasters; floods, fires, and drought. Habitat loss is a concern. Exotic fish species threaten the population with predation, competition, and hybridization (especially Rainbow and Brown Trout). **Management needs:** delineate specific conservation waters; maintain and/or enhance habitats; ameliorate effects of nonnative fishes from selected waters; reintroduce into selected habitats.

PROTECTIVE MEASURES TAKEN: Recovery plan completed, 1984. Selected streams have been renovated with antimycin A, fish barriers installed, habitat improvement structures installed, and reintroduced with pure strain Gila trout. Existing pure strain populations of Gila trout in 10 streams of New Mexico are being maintained and improved. Fish culture of Gila trout is being investigated. Public education efforts are ongoing.

SUGGESTED PROJECTS: Additional streams need to be selected for introduction of Gila trout to maintain genetic purity and diversity of the species. Logging, mining, cattle and sheep grazing, and other developmental activities should be prohibited in drainages that could or already have Gila trout populations. Reserve streams for genetically pure Gila trout, with no stocking of non-native salmonids. A suitable fish hatchery should be selected for raising Gila trout for possible reintroductions into suitable habitats. Sport fishing should be prohibited until the species is downlisted to threatened status, at which time certain streams could be opened to fishing with special regulations (lure or fly only, barbless hooks, catch and release, etc.). Potential reintroduction sites for Gila trout should be investigated in the Verde River and Agua Fria River drainages. Possible streams to be investigated should include; Sycamore Creek, Oak

Creek, Fossil Creek and East Verde River. If these sites are selected protection of these watersheds is crucial to the survival of Gila trout.

LAND MANAGEMENT/OWNERSHIP: USDA, Forest Service, Gila National Forest (New Mexico) and Tonto National Forest (Arizona).

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

The Gila Trout Recovery Team, a Multi-Agency task force, recommended that the USFWS downlist the species to threatened in 1987. However before the comment period was over, a flood eliminated more than 80% of the McNight Creek, NM population, a forest fire along with subsequent flooding eliminated the Main Diamond Creek population (the Type Locality) and drought and forest fire eliminated 90% of the South Diamond Creek population. The proposal to downlist this species was thus aborted. These events point out the fragility of small populations and dramatically demonstrates the potential for serious problems in recovery strategies.

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